



INVESTOR IN PEOPLE

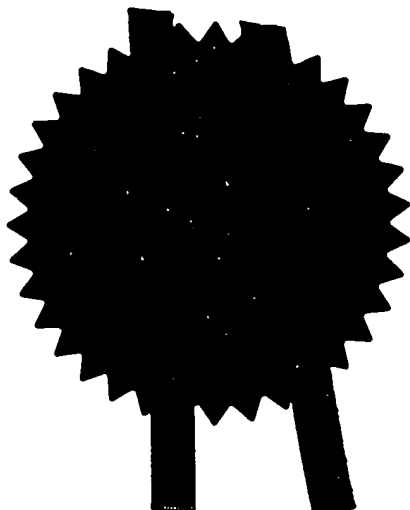
The Patent Office  
Concept House  
Cardiff Road  
Newport  
South Wales  
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

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Signed

Dated

14 FEB 2001

The Patent Office

Cardiff Road  
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# Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form).

## 1. Your Reference

P.6154GBA

## 2. Patent application number

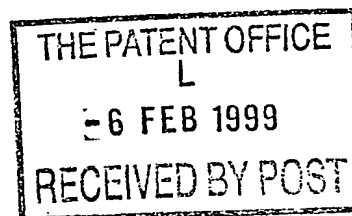
(The Patent Office will fill in this part)

06 FEB 1999

9902578.5

## 3. Full name, address and postcode of the or of each applicant (underline all surnames)

NEW TRANSDUCERS LIMITED  
Stonehill  
Huntingdon  
Cambridgeshire  
PE18 6ED  
G.B.



Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

G.B.

7133119003

## 4. Title of the invention

LOUDSPEAKERS

## 5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

MAGUIRE BOSS  
5 Crown Street  
St. Ives  
Cambridgeshire  
PE17 4EB

Patents ADP number (if you know it)

00009191002

## 6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number  
(if you know it)

Date of filing  
(day/month/year)

## 7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(day/month/year)

## 8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

Yes

a) any applicant named in part 3 is not an inventor, or  
b) there is an inventor who is not named as an applicant, or  
c) any named applicant is a corporate body:)  
See note (d)

**Patents Form 1/77**

9. Enter the number of sheets for any of the following items you are filing with this form. Do not enter copies of the same document

Continuation sheets of this form

Description 5

Claims(s)

Abstract

Drawing(s)

3 + 3



10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (*Patents Form 7/77*)

Request for preliminary examination and search (*Patents Form 9/77*)

Request for substantive examination (*Patents Form 10/77*)

Any other documents  
(please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature

Date 05/02/99

MAGUIRE BOSS

12. Name and daytime telephone number of person to contact in the United Kingdom

P.A. MAGUIRE

Tel: 01480 301588

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5

TITLE: LOUDSPEAKERS

10

DESCRIPTION

15       The invention relates to loudspeakers and more particularly to flat panel loudspeakers integrated with articles such as picture frames, display cabinets, visual display screens, mirrors and the like incorporating transparent, or translucent glass-like panels.

20       It is known from WO97/09854 to suggest driving the display screen of a laptop computer as a resonant panel loudspeaker, e.g. of the kind described in WO97/09842.

It is among the objects of the invention to provide a transparent or translucent panel-form member which can be  
25 driven as a loudspeaker, e.g. to reproduce speech or music and forming part of an article e.g. as set-out above.

According to the invention an article of the nature of a picture frame or holder, display cabinet, visual

display apparatus mirror or the like comprising an article area or surface to be viewed comprises a resonant panel-form member, at least a portion of which is transparent or translucent through which the display area or surface or article is visible and means exciting the panel-form member to resonate to act as an acoustic radiator, the exciter being disposed at an edge or margin of the transparent panel-form member so as not to intrude into the said transparent portion.

10       The member may be rigid and may be of plastics, e.g. polystyrene, or may be of glass or other transparent material. The surface or area or article to be viewed may be such that it is movable or replaceable relative to the panel-form member.

15       More than one vibration exciter may be provided. The vibration exciters may be mounted in pairs to an edge or marginal portion of the panel-form member or other portion of the member outside its transparent portion. The drive means may be coupled directly to the panel-form member.

20       The exciter(s) may be electrodynamic and may be inertial. Alternatively the exciter(s) may be piezoelectric. The exciter(s) may be resiliently mounted on a frame member, e.g. the frame or support for a picture or photograph or frame of a display cabinet. The panel-form member may be resiliently mounted on the frame along one or more edges. Thus the resilient mounting may extend along three adjacent edges and the exciter(s) may be provided on the fourth edge.

The loudspeaker may be of the general kind described in International patent application number WO 97/09842. Thus the loudspeaker may comprise a member capable of sustaining and propagating input vibrational energy by bending waves in at least one operative area extending transversely of thickness to have resonant mode vibration components distributed over said at least one area and having a vibration exciter mounted on said member to vibrate the member to cause it to resonate forming an acoustic radiator which provides an acoustic output when resonating.

One or more marginal portions of the panel-form member may be clamped or restrained, e.g. in a supporting frame. The whole periphery of the panel-form member may be mechanically clamped. The panel-form member may be mounted in means enclosing a face of the panel-form member whereby acoustic radiation from the said face is contained within the enclosure, in the manner of an infinite baffle loudspeaker.

The panel-form member may form the face of a visual display unit or the like, e.g. the outer transparent protective surface of or over the visual display screen, e.g. liquid crystal display or plasma display. A polymer-film liquid crystal display may be bonded or otherwise mounted on the panel-form member, whereby the loudspeaker and visual display functions are integrated.

The invention is diagrammatically illustrated, by way of example, in the accompanying drawings, in which:-

Figure 1 is an exploded perspective view of a picture frame intended for wall mounting combined with a loudspeaker;

Figure 2 is an exploded perspective view of a free-standing picture or photograph frame/loudspeaker combination;

Figure 3 is a perspective view of a display case incorporating a loudspeaker;

Figure 4 is a perspective view of a slim television or computer monitor or other visual display unit (VDU) incorporating a loudspeaker, and

Figure 5 is a scrap cross-sectional view through a frame or casing supporting a transparent/translucent panel which also acts as a loudspeaker, and generally applicable to the embodiments of Figures 1 to 4 above.

In the drawings Figure 1 shows a wall hanging picture frame assembly comprising a frame, a transparent panel-form member forming a protective cover over a picture. As can be seen from Figure 5, the frame is formed with a surrounding peripheral lip in which the picture is mounted and which is visible through the transparent protective cover which is in the form of a resonant panel-form member adhesively fixed in the frame along two or more edges by means of an interposed resilient suspension e.g. of foamed rubber strip. Two moving coil inertial vibration exciters are mounted on the top edge of the panel-form cover member to drive the panel to resonate to act as a loudspeaker and the exciters are mounted on resilient suspensions, e.g. of

foamed rubber, mounted to the frame. The exciters are hidden behind the peripheral lip and thus are invisible in use. The panel-form member may be of transparent polystyrene. With this arrangement the picture may easily  
5 be changed when desired.

Referring to Figure 2, there is shown a free-standing picture or photograph frame (with the picture or photograph omitted in the interests of clarity) generally similar to that of Figure 1, but intended for desk or the  
10 like mounting for use for example as a multi-media loudspeaker.

Figure 3 and 4 show respective display cabinet and television monitors incorporating transparent panels acting as loudspeakers generally in accordance with the  
15 arrangement of Figures 1 and 5.

The invention thus provides an article such as a picture frame or the like in which a protective transparent cover over the display, or perhaps the display itself, is driven to act as a loudspeaker. Thus in the  
20 case of a mirror, the back of the transparent panel-form member may be silvered. In a museum, for example, the integrated article may act as an audio-visual display and if desired the protective transparent cover may be given a UV coating for additional protection.



Fig 1

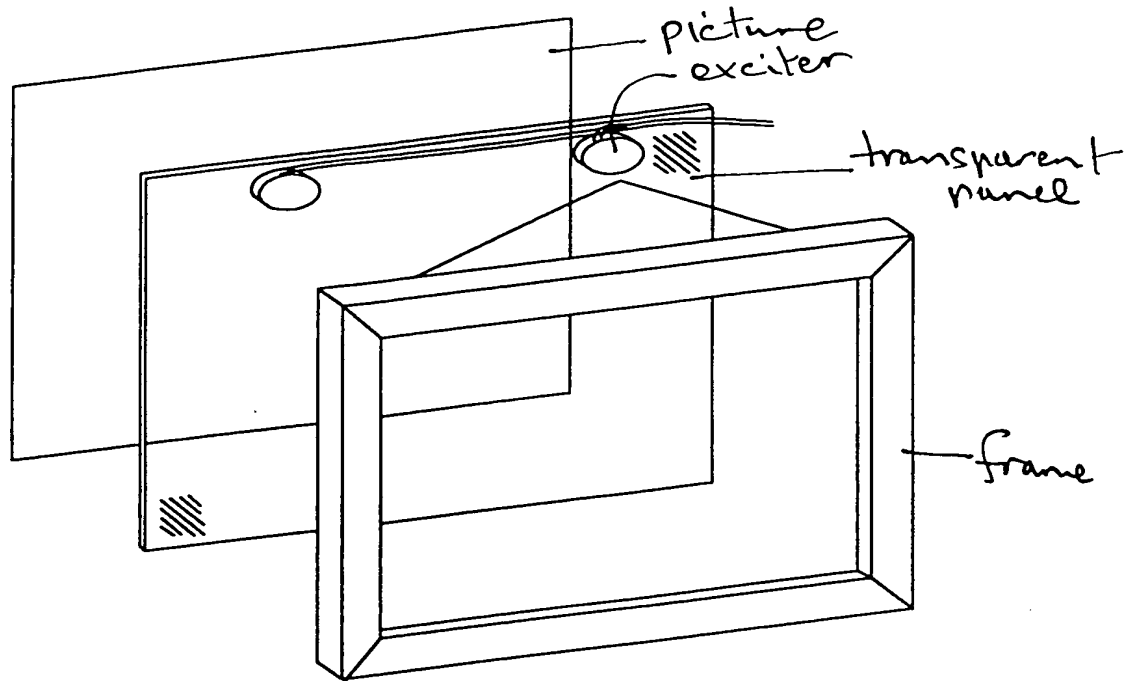


Fig 2

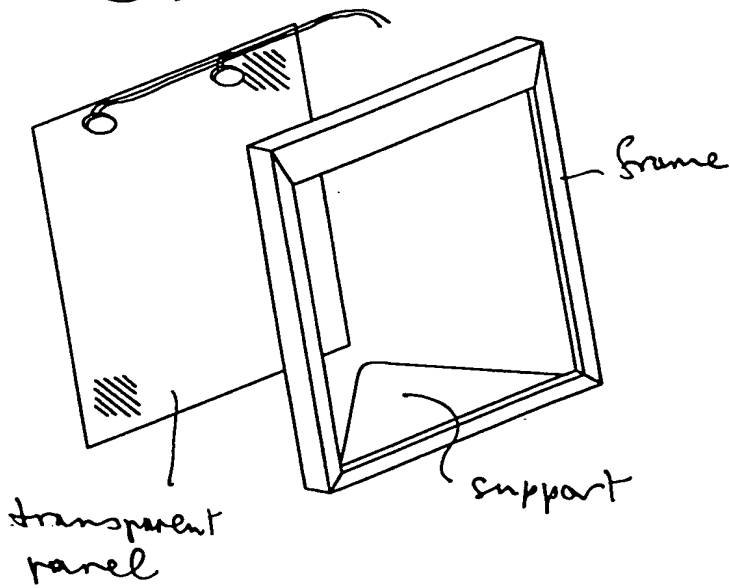


Fig 3

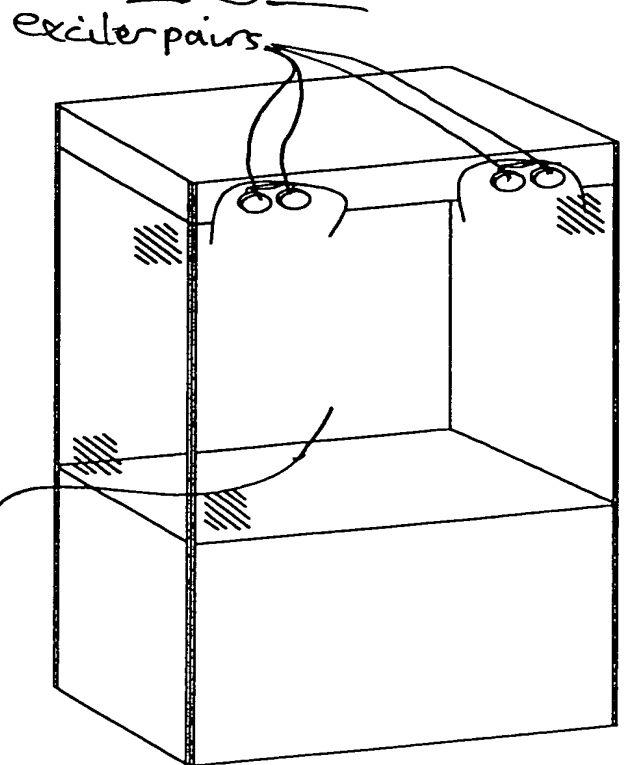


Figure 4

Television or PC monitor with edge driven, DML panel.

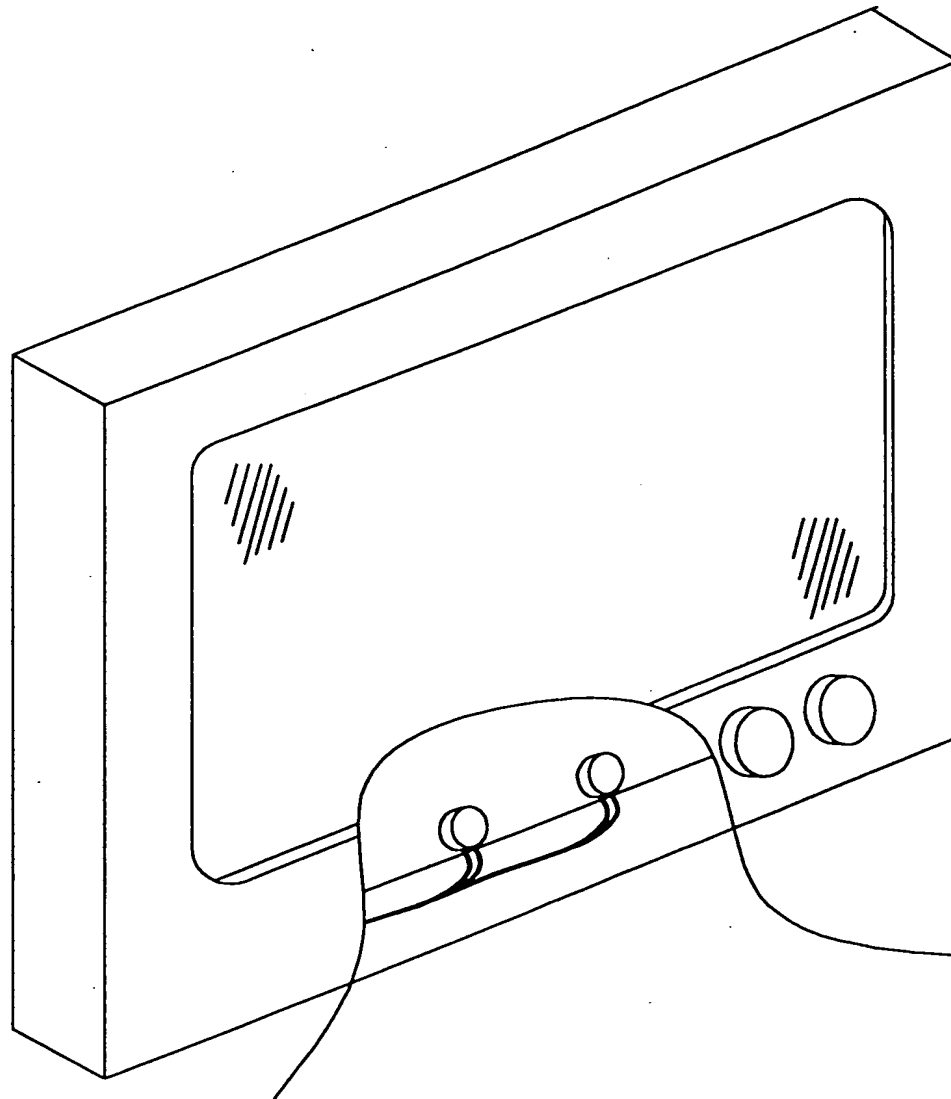


Fig 5

